

May 9.—Near Port Arthur, Tex., thunderstorms caused much damage to derricks in the oil fields. Estimated loss \$150,000.

May 10.—A tornado crossed Marshall County, Tenn., moving from Carey Springs eastward to near Uniontown, in Bedford County. Much damage occurred at Chapel Hill, where several persons were injured. Estimated damage \$50,000.

May 10-12.—Numerous locally-destructive hailstorms occurred in Georgia. Large losses were averted only on account of undeveloped crops.

May 11.—Severe hailstorms in the vicinity of Birmingham, Ala., caused much damage to trees, gardens, and some to roofs and windows. Hailstones from size of nutmegs to baseballs, but small amount of damage, due to the fact that the locality was not a farming section.

May 13.—A tornado swept through Long Branch community, 5 miles south of Lumberton, N. C., and northeasterly to Sampson County, about 2:00 p. m. Three persons were killed and a number injured. Much property loss.

May 13-14.—A severe blizzard swept over Lake Superior during the night, doing considerable damage to shipping.

May 22.—A tornado passed over Waterville, Me. Buildings were blown down and trees uprooted. No one injured.

May 22.—A severe storm at Doughty's Landing, Long Island, Me., caused considerable property damage, and blew four people into the water, one being drowned.

May 22.—A severe wind storm demolished three dwellings and hurled the tower of the American Chemical Company's factory into Penobscot Bay at Searsport, Me.

May 22.—Portland, Me., sudden squalls of wind in afternoon caused much damage throughout city and adjacent sections.

May 22.—A severe windstorm blew down or wrecked several buildings at Worcester, Mass. One man and a girl were slightly injured by flying debris.

May 23.—Three distinct hailstorms occurred in Maryland during the afternoon. The first about 2:30 p. m. moved southward across Washington County in a path about 1 mile wide. Hail varied from the size of a pea to hickory nuts and larger. Estimated damage to crops, \$100,000. The accompanying wind uprooted trees and unroofed barns. The second, about 3:30 p. m., a thunderstorm with heavy hail moved southeasterly across Kent, Queen Annes, Caroline, and Dorchester Counties. The path varied from 1 to 6 miles in width. The hail-

stones were from 1 to 1½ inches in diameter. Two persons were injured. Property loss about \$100,000; the third, about 6:00 p. m. in Garrett County. Hailstones reported as large as hen's eggs. Considerable damage to crops and trees.

May 23.—Norfolk, Va., a thunderstorm during the afternoon and night attended by heavy rain, hail, and wind. Damage by fire and water to buildings struck by lightning estimated at \$175,000.

May 26-27.—A cloudburst struck Lynchburg, Va., during the night, causing many thousands of dollars damage to truck farms.

May 26.—A tornado swept a path a quarter of a mile wide between Plymouth and Manly, Iowa. One person killed. Severe wind storms raged through a considerable portion of northeastern Iowa, a number of buildings being demolished southwest of Manchester.

May 26.—A small tornado passed over portions of Topeka, Kans., causing slight damage.

May 26.—Severe wind storm at Wichita, Kans., accompanied by thunderstorm. Damage not given.

May 27.—A tornado cut a swath one-half a mile wide and 5 miles long in southeastern Hillsdale County, Mich., during the afternoon. Houses and outbuildings were wrecked and live stock killed. One person severely injured. Property loss about \$300,000.

It is reported that wells from 20 to 30 feet deep were emptied of water by the suction of the tornado; and that water in Twin Lakes was drawn by the suction more than 100 feet into the air and fell in torrents over the adjacent land.

May 29.—Hail did much damage in Haywood County, Tenn., over a strip about one-eighth mile wide and 2 miles long near Brownsville.

AURORA.

A notably brilliant and widely reported aurora was observed on the nights of the 14th-15th, and over the more northern districts appeared first on the night of the 13th. It extended far to the southward, notably at San Juan, P. R., where it was the first observed in the 23 years' history of the Weather Bureau station at that point.

It was also observed on the Pacific coast as far south as San Francisco, where no previous note of such an occurrence appears in the past 50 years' record at that place. Considerable interruption to telegraphic and telephonic communication was experienced in the more northern districts of the United States.

A fuller report of this occurrence will appear in the next issue of the REVIEW.

STORMS AND WEATHER WARNINGS.

EDWARD H. BOWIE, Supervising Forecaster.

WASHINGTON FORECAST DISTRICT.

The month was not a notable one for storminess in the Washington Forecast District. The only general and violent storm of the month was that of the 3d to 6th, inclusive, on the Middle Atlantic and southern New England coast. This disturbance interfered greatly with shipping on these coasts and considerable damage was done. This no doubt was minimized very greatly because of the timeliness of the warnings. Special forecasts were issued for aviation. The more important of these was in connection with the National Balloon Race from Birmingham, Ala., on the 21st. Another

important aviation forecast was that for the 28th for Zone 2, the Middle Atlantic States, which stated that there was a risk of thundershowers during the afternoon. One of the Army planes, flying from Langley Field, Hampton, Va., to Bolling Field, Washington, D. C., encountered one of these disturbances and the machine was wrecked, killing the pilot and five passengers.

Storm warnings on the Great Lakes.—No storm warnings were issued and no general storms occurred on the Great Lakes during the month. The only disturbance out of the ordinary was that of the 13th and 14th, for which strong winds were forecast. This disturbance

551.515(73)
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was attended by snow on Lake Superior, but at no point did the wind reach gale force.

Storm warnings on the Atlantic Coast.—Storm warnings were displayed at 9:30 a. m. on the 1st at and between Portsmouth, N. H. and Delaware Breakwater; on the 3d at and between Cape Henry, Va., and Boston, Mass.; on the 23d at and between Eastport, Me., and Sandy Hook, N. J. The disturbance of the 3d to 6th, for which ample and timely warning was given, was the only severe storm of the month at the Atlantic coast. This storm had its origin over the East Gulf States on the 2d and on the morning of the 3d it was central over South Carolina, whence it moved north-northeastward and the morning of the 4th it was central over the lower Chesapeake Bay. During the 4th, 5th and 6th a severe northeaster was general along the coast north of the Virginia Capes to the vicinity of Boston. Storm winds prevailed at all points where warnings had previously been displayed. The maximum velocity reported was 60 miles per hour from the northeast at Block Island, R. I., on the 5th.

Storm warnings on the East Gulf Coast.—No storm warnings were ordered for the East Gulf Coast during the month; none were required.

Frost warnings.—Warnings of frosts or temperatures injurious to vegetation were issued on a number of days for the northern and middle portions of the district. No frosts of consequence occurred in the Southern States.

CHICAGO FORECAST DISTRICT.

The temperature during the first half of the month of May, 1921, averaged below normal generally over the greater portion of the Chicago forecast district, especially in eastern sections, while the latter half was unusually warm, record-breaking maxima being registered at many points in the middle Mississippi and lower Missouri valleys during the closing days of the third decade.

Warnings of frost or freezing temperature were of frequent occurrence during the first half of the month and were issued for various portions of the district on the 1st, 2d, 3d, 4th, 8th, 11th, 12th, 13th, 14th, and 15th. The most pronounced periods of cool weather during which frosts and temperatures near freezing occurred progressively over the district were those from the 1st to the 5th, inclusive, and from the 12th to 16th, inclusive.

Special frost warnings were sent to the cranberry growers of Wisconsin on the 1st, 2d, 3d, 4th, 13th, 15th, 16th, 28th, and 31st. No live stock warnings were issued during the month and the only frost warning during the latter half was issued for Montana on the 27th.—*E. H. Haines.*

NEW ORLEANS FORECAST DISTRICT.

Quiet conditions prevailed except for strong winds occurring locally in a few thunderstorms. No storm warnings were issued or required.

Warning of frost in low places in Arkansas was issued on the 3d and 4th, and frost occurred in the extreme northern portion of that State.—*R. A. Dyke.*

DENVER FORECAST DISTRICT.

The weather during the month was dominated largely by a series of low pressure areas from the Plateau region, and cool and wet weather prevailed in the greater part of the district. In eastern Colorado, however, the weather was warm and dry.

Frost or freezing temperature warnings were issued for parts of the District on the 1st, 3d, 7th, 8th, 9th, 10th, 12th, 13th, 17th, and 18th, and were followed generally by frost temperatures or freezing weather in localities. On the 13th, however, the anticipated rise in barometer did not occur in northern New Mexico and temperatures remained well above freezing. No warnings were issued after the 18th, and no damaging weather conditions occurred.—*Frederick W. Brist.*

SAN FRANCISCO FORECAST DISTRICT.

There was a great deal of unsettled weather in this district during the month, but no very severe storms occurred. Storm warnings were displayed on the 5th along the southern California coast, and small craft warnings were ordered on the 1st at Point Reyes and on the 28th along the entire California coast. All of these warnings were fully verified.

The following unsolicited testimonial, dated Summerland, Calif., May 31, 1921, was received from Mr. W. J. Turrentine, in charge of the work of extracting potash from kelp in southern California:

I take this occasion to thank you and the members of your organization for the splendid service you have given us during the past four years. Your warnings have been a source of a great deal of comfort, and have been of the greatest service to us in enabling us to take precautions upon the approach of storms. We have gotten by during the four years without any damage from the elements, and the success has been due largely to your kind assistance. Your cooperation is most heartily appreciated.

The potash plant operated a barge in the open sea, and consequently it was more frequently endangered than a stauncher craft would have been under similar weather conditions. The potash works will cease operations on June 30, 1921, and for this reason the special warnings furnished them will no longer be required.

Frost warnings were sent to one or more places on ten occasions, mostly to stations in the Plateau section of this district, and they were generally verified.

The feature of the month, besides the prevalence of many days with unsettled weather, was the phenomenal rains in southern California from the 20th to the 23d. They broke all previous records for the month of May, but they were not heavy enough to cause floods of consequence nor to overcome the deficiency in precipitation for the season, though they materially lessened it. On account of the temperatures being below normal, the runoff of streams in California and Nevada was barely sufficient for irrigation and hydroelectric needs.—*E. A. Beals.*